"The Halogen Hydrides as Conducting Solvents.—Part III. The Transport Numbers. Preliminary Notice." By B. D. STEELE. Communicated by Sir WILLIAM RAMSAY, K.C.B., F.R.S. Received November 29,—Read December 15, 1904.

In continuation of this investigation* the transport numbers of several substances have been measured when dissolved in liquefied hydrogen bromide.

The substances selected were ethyl ether, acetone, methyl hexyl ketone and triethylammonium bromide, the first two of which have been shown to form compounds with hydrogen bromide.

As a preliminary to the main series of experiments the validity of Faraday's law for solutions in hydrogen bromide was tested, and the law found to hold within the limits of the errors of experiment of the method employed, which consisted in the direct comparison of the amount of hydrogen evolved during the electrolysis of various substances in hydrogen bromide solution, with the weight of silver deposited at the cathode of a silver voltameter.

In one experiment the amount of hydrogen evolved was 19·7 c.c., the hydrogen equivalent of the silver deposited being 19·8 c.c.

The transport numbers were determined by the method of Hittorf at a temperature of $-81°$.

Great difficulties were experienced in carrying out the analyses with the required degree of accuracy, and the method of analysis finally found to be successful was one depending on the direct weighing of the whole solution to be analysed in a specially constructed absorbing apparatus, and the subsequent determination of the hydrogen bromide by titration, the difference giving the amount of dissolved substance contained in the solution taken.

The following mean values were found for the transport number of the cation :—

Ether	$n = 1·0$,	$p = 0·82$
Triethylammonium bromide.....	$n = 0·5$ to $0·75$,	$p = 0·20$
	$n = 1·04$,	$p = 0·35$
Acetone	$n = 1·0$,	$p = 0·38$
	$n = 1·8$,	$p = 0·95$
Methyl hexylketone	$n = 0·9$,	$p = 0·39$
	$n = 1·8$,	$p = 0·77$

n = concentration expressed in gramme-molecules per litre.

p = cation transport number.

The experiments show that the cation transport number increases with increasing concentration, and that the ether (or acetone, &c.), functions as the cation or as a component part of it.

* ' See ' Roy. Soc. Proc.,' vol. 73, pp. 450—455.